PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
13579WO15212		

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/IL 03/00585	15.07.2003	15.07.2002

International Patent Classification (IPC) or both national classification and IPC
G08B13/196

Applicant
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1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 11 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the opinion
   - II ☐ Priority
   - III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
10.02.2004	04.10.2004

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/IL 03/00585

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

1-38 as originally filed

Claims, Numbers

1-37 received on 15.09.2004 with letter of 13.09.2004

Drawings, Sheets

1/12-12/12 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).

   ☐ the language of publication of the international application (under Rule 48.3(b)).

   ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   ☐ contained in the international application in written form.

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority in written form.

   ☐ furnished subsequently to this Authority in computer readable form.

   ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

   ☐ the description, pages:

   ☐ the claims, Nos.:

   ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

   ☐ the entire international application,

   ☒ claims Nos. 27

   because:

   ☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (specify):

   ☐ the description, claims or drawings *(indicate particular elements below)* or said claims Nos. are so unclear that no meaningful opinion could be formed *(specify)*:

   ☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

   ☒ no international search report has been established for the said claims Nos. 27

2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/ or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

   ☐ the written form has not been furnished or does not comply with the Standard.

   ☐ the computer readable form has not been furnished or does not comply with the Standard.

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-26 28-37
	No:	Claims	
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-26 28-37
Industrial applicability (IA)	Yes:	Claims	1-26 28-37
	No:	Claims	

2. Citations and explanations

   see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1.1. Reference is made to the following documents:

D1: EP-A-1 170 715 (H A N D GMBH) 9 January 2002 (2002-01-09)
D2: DE 197 09 799 A (BOSCH GMBH ROBERT) 17 September 1998 (1998-09-17)
D3: US-A-5 790 183 (KERBYSON GERALD M) 4 August 1998 (1998-08-04)
D4: DE 198 09 210 A (SIEMENS AG) 16 September 1999 (1999-09-16)
D5: JP-A-2000 059796 (INOUE SHUJI ET AL) 25 February 2000 (2000-02-25)(interpreted after US-B-6 512 5371, published 28 January 2003 (2003-01-28))
D6: US-A-5 862 508 (MIYATAKE TAKAFUMI ET AL) 19 January 1999 (1999-01-19)

1.2. The present application does not meet the criteria of the PCT, because the subject-matter of claim 1 is not clear in the sense of Article 6 PCT.

In the amended claim as on file, the coexistence of an option "OR" in the pairs of optical OR thermal imagers, is not consistent with point d) of the method claimed , where it is clearly necessary to provide both types of data. This option included in the claim is not possible, and makes its scope unclear.

1.3. Even interpreting only the possiblity of the system featuring both thermal and optical imagers as claimed, and seeking to give an opinion on the only possible clarified interpretation of the claim, its subject matter would lack the required inventive step (Art. 33(3) PCT)

The document **D1** discloses (the references in parentheses applying to this document) a method for the monitoring of an environment, comprising the steps of:

a) defining and storing in a memory programs for processing, in real-time, data obtained from the observation of objects by one or more pairs of optical and/or thermal imagers (Par. 0034; See comment above, clarity, and below concerning thermal imaging), relatively positioned along a common vertical line, for identifying said objects and determining whether they are dangerous;(Col. 2, lines 20-34);

c) determining and storing parameters according to which the observation of the controlled space is effected (Col. 2, lines 41-44; Col. 2, lines 49-54; Col. 4, lines 5-32);

d) carrying out photographic observation of the controlled space or sections thereof according to the aforesaid observation parameters (Col. 2, lines 7-20); and

e) Jointly processing the digital data representing said optical and thermal photographs(par. 0034; see clarity above, as well as comment below with regard to the presence of thermal imaging), to determine whether possible dangerous objects have been detected, and if so, classifying said objects according to the stored danger parameters (Col. 6, lines 15-26).

- The term "processing in real time" is deprived from a precise technical content which can be opposed to "using a bank of scenarios" as in D1. A system can use a bank of scenarios and yet process data in real time as claimed.

- Even in the case of considering only the AND option, the claim should be deemed not inventive, since D2 discloses the attachement of two imagers to a single pole (not being the fact that they are positioned along a common vertical line a feature which can be identified as involving an inventive step over the prior art). On the other hand, the term "videosensor" used in D2 does not exclude thermal imaging. The use of thermal imaging being a normal surveillance option that would be incorporated by the person skilled in the art without exercise of inventive step in a system intended for outdoors day and night (an airport, such as in D1) surveillance, it cannot serve as the basis for the assessment of inventiveness.

The subject matter of claim 1 does not, thus, involve an inventive step (Art. 33(2) PCT).

1.3. To claim 28,it also lacks clarity, insofar the term "photographic/thermal" does not reflect unambiguously what type of observation is undertaken (alternative, concurrent, combined, for instance. It has to be noticed also that photographic and thermal are not exclusive concepts). and does not define clearly the claim as required by Art. 6 PCT.

An interpretation of the claim as including thermal and optical imagers would lead to the same conclussion as in claim 1.

Furthermore, independent claim 28 only incorporates to the disclosure of D3 a set of features that represent commonplace characteristics in monitoring apparatuses, corresponding to non connected technical problems (the vertical alignment and

the thermal imaging), where a common inventive concept cannot be indentified, and is, for instance anticipated by D3.

The same considerations with regard to the "real time processing" or the "thermal and / or optical imagers" as above apply.

D3 discloses, as far as it can be interpreted, an apparatus for monitoring an environment comprising:

a) One or more pairs of optical and/or thermal imagers (see D3 Col. 6, line 30-48, as well as comment above), relatively positioned along a common vertical line for carrying out photographic/thermal observation of the controlled space or sections thereof (Fig. 4, 111) ;

b) a set of motors for changing the sections of the said photographic observation (Fig. 4, 121);

c) elaborator means for jointly processing the digital data representing said optical and thermal photographs, to determine whether possible dangerous objects have been detected, and if so, classifying said objects according to the stored danger parameters, processing the digital data representing the photographs taken by said photographic devices(Fig. 4, 211; Col. 6, line 30- Col. 7 line 2,),

d) memory means for storing the digital data representing said photographs and the results of said processing (Fig. 4, 221).

The subject matter of claim 28 cannot be regarded as involving an inventive step.

NEW CLAIMS

1. Method for the monitoring of an environment, comprises the steps of:

a) defining and storing in a memory programs for processing, in real-time, data obtained from the observation of objects by one or more pairs of optical and/or thermal imagers, relatively positioned along a common vertical line, for identifying said objects and determining whether they are dangerous;

b) determining and storing parameters according to which the observation of the controlled space is effected;

c) carrying out photographic observation of the controlled space or sections thereof, according to the aforesaid observation parameters; and

d) jointly processing the digital data representing said optical and thermal photographs, to determine whether possible dangerous objects have been detected, and if so, classifying said objects according to the stored danger parameters.

2. Method according to claim 1, further comprising:

a) changing the sections of the said photographic observation so as to monitor the path of any detected dangerous objects;

b) receiving and storing the data defining the positions and the foreseen future path of all authorized bodies;

c) extrapolating the data obtained by monitoring the path of any detected dangerous objects to determine an assumed future path of said objects; and

d) comparatively processing said assumed future path with the foreseen future path of all authorized bodies, to determine the possible danger of collision or intrusion.

3. Method according to any of claims 1 or 2, further comprising determining an action on dangerous objects that will eliminate the danger of collision, intrusion or damage.

4. Method according to claim 3, wherein the action is the destruction of the dangerous object.

5. Method according to claim 3, wherein the action is change in their assumed future path the dangerous object.

6. Method according to claim 2, further comprising determining an action on an authorized body that will eliminate the danger of collision, intrusion or damage.

7. Method according to claim 6, wherein the action is a delay in their landing or take-off of the aircraft or a change of their landing or take-off path.

8. Method according to claim 1, further comprising giving alarms signaling the presence and nature of any dangerous objects, the danger of collisions and possible desirable preventive actions.

9. Method according to claim 1, wherein the photographic observation is carried out by performing the steps of:

a) modifying the angle of one or more photographic devices;

b) photographing one or more photos with said photographic device;

c) processing said photographed one or more photos by a computerized system; and

d) repeating steps a) to c).

10. Method according to claim 9, wherein the photographic observation is carried out as a continuous scan or segmental scan.

11. Method according to claims 1 and 9, wherein the processing of the digital data comprising the step of:

a) setting initial definition for the photographic observation and for the processing of the data of said photographic observation;

b) storing in the memory the data that represent the last photographed one or more photos at a specific angle of the photographic devices; and

c) processing said data for detecting suspected objects, by performing, firstly, pixel processing and secondly, logical processing; and

d) deciding whether said suspected object is a dangerous object.

12. Method according to claim 11, wherein the pixel processing comprising the step of:

a) Mathematically processing each pixel in a current photo for detecting suspected objects; and

b) Whenever a suspected object is detected, at least two photographic devices, being positioned vertically one above the other in distance from each other, provides photos at same time period and same monitored section, generating data regarding said suspected object from at least said two photographic devices, said generated data is a 3-D data.

13. Method according to claim 12, wherein whenever the pixel processing detects moving object, it comprises the steps of:

a) comparing the current photo to an average photo generated from the previous stored photos, said previous stored photos and said current photo was photographed at the same photographic device angle;

b) generating a comparison photo from the difference in the pixels between said average photo said current photo, each pixel in said comparison photo represents an error value;

c) comparing each error value to a threshold level, said threshold level is dynamically determined to each pixel in the photo matrix

statistically according the previous pixel values stored in the memory as a statistic database;

d) whenever a pixel value in said comparison photo exceeds said threshold level, generating a logic matrix in which the location of said pixel value is set to a predetermined value; and

e) upon completing comparing each error value to said threshold level, for the entire current photos, transferring said generated logic matrix to the logic process stage.

14. Method according to claim 12, wherein whenever the pixel processing detects static object, it comprises the steps of:

a) Generating an average photo from the current one or more photos;

b) generating a derivative matrix from said average photo for emphasis relatively small objects at each photo from said one or more photo, which might be potential dangerous objects;

c) storing said derivative matrix in the memory as part of a photo database, and comparing said derived matrix with previous derivative matrix stored in said memory as part of said photo database, said previous derivative matrix is derived from one or more photos that was taken from the exact photographic device angle as of said average photo;

d) From the comparison, generating an error photo, wherein each pixel in said error photo represents the error value between said derivative matrix and said previous derivative matrix;

e) comparing the value of each pixel from said error photo to a threshold

17. Method according to claim 1, wherein the photographic observation is taken from at least two cameras.

18. Method according to claim 17, wherein the cameras positioned with the same view angle are located at a distance of 0.5 to 50 meters from each other.

19. Method according to claim 18, wherein the cameras positioned with same view angle are installed on the same pole.

20. Method according to any of claims 18 or 19, wherein the cameras positioned with same view angle are being rotated thus their view angle is changed simultaneously.

21. Method according to any of claims 17 to 20, further comprising providing at least one encoder and at least one reset sensor for determining the angle of each camera, said encoder and reset sensor are provided to each axis that rotates a camera.

22. Method according to claim 21, wherein the reset sensor provides the initiation angle of the camera at the beginning of the scanning of a sector and the encoder provides the current angle of the camera during the scanning of the sector.

23. Method according to claim 1, further comprising the steps of:

a) generating a panoramic image and a map of the monitored area by scanning said area, said scanning being performed by rotating at least a pair of distinct and identical imagers around their central axis of symmetry;

b) obtaining the referenced location of a detected object by observing said object with said imagers, said location being represented by the altitude, range and azimuth parameters of said object; and

c) displaying the altitude value of said object on said panoramic image and displaying the range and the azimuth of said object on said map.

24. Method according to claims 23, wherein the imagers are photographic devices selected from the group consisting of: CCD or CMOS based cameras or Forward Looking Infra Red (FLIR) cameras.

25. Method according to claim 23, wherein the distance, in an angle, between each two imagers is between 0.5 to 50 meters.

26. Method according to claim 23, wherein the imagers are not identical and do not share common central axis of symmetry or of optical magnification but have at least an overlapping part of their field of view.

27. Method according to claims 1 and 2, further comprising documenting the activities of the wildlife and other dangerous objects, for preventing and reducing from said wildlife and said other dangerous objects to appear at the monitored area.

28. Apparatus for the monitoring an environment, comprising:

a) one or more pairs of optical and/or thermal imagers, relatively positioned along a common vertical line for carrying out photographic/thermal observation of the controlled space or sections thereof;

b) a set of motors for changing the sections of the said photographic observation;

c) elaborator means for jointly processing the digital data representing said optical and thermal photographs, to determine whether possible dangerous objects have been detected, and if so, classifying said objects according to the stored danger parameters, processing the digital data representing the photographs taken by said photographic devices;

d) memory means for storing programs for processing, in real-time, data obtained from the observation of objects by said imagers, and for identifying objects and determining whether they are dangerous.

29. Apparatus according to claim 28, wherein the photographic devices comprise one or more CCD or CMOS camera and/or one or more infrared cameras.

30. Apparatus according to claim 28, wherein the distance, in an angle, between each two cameras located on the same pole is between 0.5 to 50 meters.

31. Apparatus according to claim 28, in which the photographic devices are at least a pair of distinct and identical imagers.

32. Apparatus according to claim 28, in which each photographic device is provided with a different lens.

33. Apparatus according to any of the claims 28 to 31, further comprising:

a) elaborator means for obtaining the referenced location of a detected object in said controlled space, said location being represented by the altitude, range and azimuth parameters of said object;

b) means for generating a panoramic image and a map of the monitored area;

c) means for displaying the altitude value of said object on said panoramic image and means for displaying the range and the azimuth of said object on said map.

34. Apparatus according to claim 33, in which the means for displaying the monitored area are using three-dimensional software graphics where

the location of each detected object is indicated as a three-dimensional image.

35. Apparatus according to claim 33, in which the elaborator means are one or more dedicated algorithm installed within the computerized system.

36. Apparatus according to claims 28 or 31, further comprises a laser range finder being electrically connected to the computerized system for measuring the distance of a detected object from said laser range finder, said laser range finder transfers to said computerized system data representing the distance from a detected object, thereby aiding said computerized system to obtain the location of said detected object.

37. Method according to claim 1, further comprising procuring, adjourning and storing in a memory files representing the background space.